ABSTRACT OF THE DISCLOSURE

A shutter mechanism for use with a direct oxidation fuel cell system is provided within a fuel cell system between the reactant to be controlled and the MEA of the fuel cell . On the anode side, the shutter mechanism can disposed in the vapor gap between a passive mass transport barrier and the anode current collector. This embodiment of the shutter mechanism of the present invention operates in z-axis plane perpendicular to the plate itself and perpendicular to the general direction of fuel flow. In this manner, additional lateral volume is not required for movement of the shutter plate. In accordance with another aspect of the invention, one part of the shutter mechanism is integrated into the current collector, the fuel cell housing, or other component of the fuel cell. In other words, the moving shutter plate has features that correspond with openings in either the anode or the cathode current collector, and such features can be used in conjunction with the current collector to provide control of substances travelling into and out of the fuel cell. The present invention can also be used for heat transfer within the fuel cell system.